



GEOLOGIC CHARACTERIZATION OF LOCHLOOSA LAKE

ALACHUA COUNTY, FLORIDA

confining unit is thin or absent.

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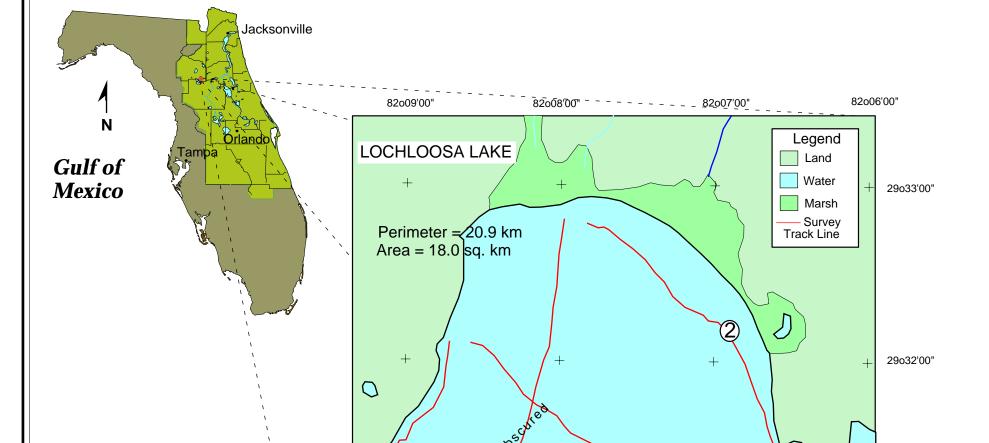
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INTRODUCTION

The potential fliud exchange between lakes of northern Florida and the Floridan aquifer and the process by which exchange occurs is of critical concern to the St. Johns River Water Management District (SJRWMD). High-resolution seismic tools with relatively new digital technology were utilized in collecting geophysical data from > 40 lakes and rivers. The data collected shows the application of these techniques in understanding the formation of individual lakes and rivers, thus aiding in the management of these natural resources by identifying breaches or areas where the confining units are thin or absent between the water bodies, the Intermediate aquifer and the Floridian aquifer.

This study was a cooperative investigation conducted from 1993 to 1996 by the SJRWMD and U.S. Geological Survey Center for Coastal Geology (USGS). Since 1989 there have been technical and hardware advances in the digital acquisition of high-resolution seismic data. The primary objective of this cooperative was to test newly developed digital high-resolution single-channel marine seismic continuous-profiling-equipment (HRSP) and apply this technology to identify subbottom features that may enhance leakage from selected lakes and the St. Johns River. The target features include: (1) identifying evidence of breaches or discontinuities in the confining units between the water bodies and the aquifer, and; (2) identifying areas where the

METHODS

In cooperation with SJRWMD the USGS acquired and upgraded a digital seismic acquisition system. The Elics Delph2 High-Resolution Seismic System was acquired with proprietary hardware and software running in real time on an Industrial Computer Corp. 486/33 PC. Hard-copy data was displayed on a gray scale thermal plotter. Digital data was stored on a rewritable Magneto-Optical compact disk. Navigation data was collected using a Trimble GPS or PLGR (Rockwell) GPS. GeoLink XDS mapping software was used to display navigation.

The acoustic source was the Huntec Model 4425 Seismic Source Module and a catamaran sled with an electromechanical device. Occasionally, an ORE Geopulse power supply was substituted for the Huntec Model 4425. Power was set at 60 joules or 135 joules depending upon conditions. An Innovative Transducers Inc. ST-5 multi-element hydrophone was used to detect the return acoustical pulse. This pulse was fed directly into the Elics Delph2 system for storage and processing.

Forty-four line-km of HRSP data was collected from Lake Disston. A velocity of 1500 meters per second (m/s) was used to calculate a depth scale for the seismic profiles. Measured site

specific velocity data is not available for these sites.

These surveys were conducted in part to test the effectiveness of shallow-water marine geophysical techniques in the freshwater lakes of central Florida. Acquisition techniques were similar but modifications were necessary. Data quality varied from good to poor with different areas and varying conditions. As acquisition techniques improved so did data quality in general.

In many areas an acoustic multiple masked much of the shallow geologic data.

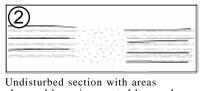
Physiography

Lochloosa Lake is located in the Alachua Praries, southern Alachua county. Part of the Ocala Uplift, this area of highly mature karst terrain has been dissolved virtually to the water table (Brooks,), creating loosely connected marshlands and lakes. Lochloosa is connected via Cross Creek to Lake Orange, which ultimately connects via canal to Paynes Prarie to the north. The shoreline is predominantly marshland, with Lochloosa creek to the north and Little Lochloosa and Right Arm Lochloosa lake to the south and west. Lochloosa Lake is irregular in shape, with a perimeter of 21 kilometers and an area of about 22 square kilometers. Lake elevation at the time of the seismic survey was 57.5 feet NVGD.

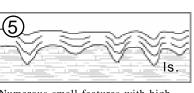
GEOLOGIC CHARACTERIZATION

The quality of the seismic profiles obtained from Lake Lochloosa is generally poor. The is primarily due to both a pervasive bottom multiple throughout the lake and abundant acoustic noise in the subsurface. The latter is probably due to the high organic content in the bottom sediments seen in the marsh lakes of this area. Scott, 1988 describes the top of the Hawthorn Group (Coosawhatchie Fm.) to be very near the surface in this area (<20 feet). Although this is not readily apparent in the seismic profiles acquired in Lochloosa, it does correlate with some of the data obtained in neighboring Lake Orange. In some areas of Lake Lochloosa, there does appear to be a reflector visible at about 8ms (~20 feet) although it is not readily mappable due to the noise and bottom multiple. The most characteristic feature visible in the seismic profiles from Lochloosa are similar to the Type 2 feature shown in the explanation (Seismic profile A-A'). This is a typical return in this type of lake and is probably not related to subsurface structure. In a couple of places it is possible that numerous, high angle reflectors could indicate a Type 5 or 8 feature (see Index map).

EXPLANATION



Undisturbed section with areas obscured by noise created by muck or aquatic vegetation dispersing the acoustic signal



Numerous small features with high angle reflectors dipping toward their center. These features may represent localized collapse sinks or filled solu-

